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the distribution of the rain from year to year is very capricious, but where, none the less, the forests are well maintained. Mr. Schott's investigations give us no authority for saying that the prairie region is more liable to droughts than the region of forest immediately adjacent to it.[1]

That an excess of moisture is in general prejudicial to tree-growth must of necessity be admitted. This fact seems to form the basis of the views of Mr. Lesquereux in regard to the origin of prairies. And to a considerable extent there is a harmony of opinion between us; indeed, the writer finds that this gentleman is the only one of those who have written on the prairies who has carefully observed the leading facts. Before, however, noticing his views, it will be well that the author of this article should state exactly to what results his own observations have led him, and what seems to him the all-important consideration influencing the character of the vegetation in the prairie region.

(To be concluded in the next number.)

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CARNIVOROUS PLANTS.

BY PROF. W. J. BEAL.

THIS is a new term which has lately been applied to plants that catch insects by various contrivances.

In 1768, over one hundred years ago, Mr. Ellis discovered that the Venus fly-trap, of North Carolina, catches insects by a peculiar construction of the tips of its leaves, like a steel-trap. Numerous experiments have satisfied botanists that flies are not only caught, but digested by a fluid poured out by the plant, and the materials absorbed into the tissues of the plant. In 1780, ninety-five years ago, the sun-dew (*Drosera*) was found to catch insects by its sensitive hairs with a sticky gland at the end of each.

Drosera rotundifolia, a common little plant of our marshes, has a round leaf, about the size of a cent, sometimes containing eighteen small flies. The glandular hairs move toward the fly when irritated.

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[1] See page 158 of Mr. Schott's paper. He says, "The observed succession of annual amounts of rain-fall on the Atlantic coast from Maine to Virginia, and in the interior of the State of New York, seems to be governed by the same circumstances or laws, as is evident by a comparison of the curves of Type I. [Maine to Virginia] and Type II. [State of New York], and indeed Type III., region of the Upper Mississippi (Iowa), bears some resemblance to these curves, but is not yet sufficiently developed to be pronounced identical in character. . . . . The remarkable period of droughts about 1836, as well as the less conspicuous or relative one of 1855, are common to the two regions [Type I., State of New York, and Type IV., region of Upper Mississippi, Iowa]."

Drosera longifolia has a very long, slender leaf, also covered with glandular hairs. It rapidly coils up from the tip, catching flies, which it devours and absorbs.

North America has eight species of pitcher plants (*Sarraceniaceæ*) the leaves of which catch insects. They have stiff hairs inside, pointing downward, which prevent the escape of most insects. Some have a sweet secretion below the opening at the top on the outside. This grows sweeter and sweeter and more abundant, till it comes to the opening, to entice foolish flies to the fatal pit whence no fly ever returns.

Catesby, some years ago, thought these pitchers were an asylum for insects to escape from frogs and other animals. I have here some fresh specimens of *Sarracenia purpurea*, the only pitcher plant found in Michigan. Pouchet, in his popular book, The Universe, speaking of this plant, says, "The leaves rise from spot to spot at the feet of the traveler, and are filled with pure and delicious water, for the benefit of which he is all the more grateful that he is encircled by nothing but marshes." The truth is, the water abounds in rotten bugs and worms.

Of *Nepenthes* there are some thirty species, most of which secrete honey on some parts of their pitchers, to entice insects, which they catch and devour.

The spathe of *Alocasia*, it is said, catches slugs and destroys them in a strong secretion. For a full account of the above interesting plants, see Dr. Hooker's Inaugural Address, last year, at the British Association, printed in *Nature*, x. 366.

Pinguicula catches insects.

According to Mrs. Treat, bladderworts (*Utricularia*) catch infusoria and other small animals. These are taken by strange devices in the little bladders, which work like some miniature eel trap. The animals are dissolved and contents absorbed by the plant. In addition to the above, we have quite a large number of other plants belonging to divers natural orders, which catch insects. The young leaves and stems of *Rhododendron* is one of them. A species of *Plumbago* in the green-house, sent from the Agricultural Department at Washington, has viscid hairs about the flowers, large enough to catch and hold a common house-fly, even if caught by one or two legs. Several species of *Polanisia*, *Cupœa viscosa*, some species of *Physalis*, and *Solanum*, catch small insects by sticky hairs on the younger portions of the plant.

Many species of *Silene* attract, catch, and hold insects to such an extent that the genus goes by the popular name of "catch-fly."

Lychnis vespertina, a kind of cockle sometimes in our wheat fields, also takes small insects. It seems to digest them by the small glands at the end of the hairs. We need not necessarily suppose that they are digested because they are captured by sticky plants.

The large bud scales of the horse-chestnut and balsam poplar, in the spring of the year, are often found holding insects by the sticky varnish with which the buds are very copiously covered. We see that the varnish may be of use to protect the inner delicate parts of the bud from the inclement weather, but I am unable to see that insects are of any advantage to the plant when so caught. The dry bud scales are sticky for a purpose which we can readily understand. The flies are most likely accidentally caught. Possibly this is the case with some other plants which catch insects by a sticky secretion or other contrivance. I have lately given some attention to the *Martynia* on account of the great numbers of small insects which it catches by glandular hairs. On August 3d I counted seventy-six small Diptera and some other insects on the upper side of a young leaf of about four inches average diameter, and two hundred on the under side. The insects are caught on all parts of the plant which are exposed, on the stems, on the calyx and corolla, including even the throat of the corolla. Among a lot of others was one plant about three feet high, spreading three feet in diameter, which according to estimate had seven thousand two hundred small flies on it at one time. The hairs are very numerous all over the surface. None of them are sensitive, as I can find. They vary exceedingly in length, from three sixteenths of an inch to one one-hundredth or even shorter. Some of them have as many as ten cross partitions. The contents of these cells appear quite clear, except one near the top, next to the top cell. This is larger than several of those below, and contains chlorophyll. It seems to be something like a gland. Above this is a larger cell, with perpendicular striæa along its sides. When fresh and undisturbed the top is nearly spherical and resembles a small drop of dew. The secretion is quite copious and exceedingly viscid, with an unpleasant odor. I placed some small fragments of raw beef on the glands one morning, but the sun seemed to dry them up, much as it did those left on blades of grass which had no glands. I placed some very minute portions on the glands in a spot sheltered from the direct rays of the sun. In some cases the whole of the piece of beef disappeared.

The small insects seem to live but a short time, although they are touched by only two to four hairs. The substance seems to be soon taken out of the insects. In my opinion, it is a true insectivorous plant. (Proceedings Amer. Assoc. Adv. Sc., 1875.)

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A CENTURY'S PROGRESS IN AMERICAN ZOÖLOGY.

BY A. S. PACKARD, JR.

THE title of this article is almost a misnomer, since American zoölogical science dates only from 1796, when Barton published his Memoir on the Fascination attributed to the Rattlesnake, while his Facts, Observations, and Conjectures on the Generation of the Opossum appeared in 1801. These were simply memoirs, but still talented productions and not unworthy to begin the century. Previous to this, John Bartram published a few zoölogical tracts in the Philosophical Transactions of the Royal Society of London, the first appearing in 1744, while his Description of East Florida, etc., was published in London in 1769.

John Bartram was born in this country, and so was Barton; but the latter was, perhaps, the more genuine biologist, and his work was so well appreciated in England that he was called by Swainson the "father of natural history in America." The first century of American zoölogy should, then, date from 1796, and it had a worthy beginning.

American systematic zoölogy may be said to date from the years 1808–14, when the successive volumes of Wilson's Ornithology were published, though it should be remembered that Wilson was born and bred in Scotland. Thus, with the exception of Bartram's and Barton's works, what we have to say of American zoölogy (including animal physiology and psychology and embryology) covers only a little over half a century.

The next work was by Prince Bonaparte, on birds, a volume complementary to Wilson's great work, and published in this country in 1825–33.

But the first general work by a native-born American was Dr. Richard Harlan's Fauna Americana, published in 1825. This was succeeded by Dr. John D. Godman's work on North American Mammals, published in three volumes in 1826–28. Bartram,[1]

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[1] John Bartram was born at Darby, in the suburbs of Philadelphia.